

Viscosity Measurement via Drop Coalescence: A Space Station Experiment

The concept of using low gravity experimental data together with CFD simulations for measuring the viscosity of highly viscous liquids was recently validated on onboard the International Space Station (ISS). A series of microgravity tests were conducted for this purpose on the ISS in July, 2004 and in May of 2005. In these experiments two liquid drops were brought manually together until they touched and were allowed to coalesce under the action of the capillary force alone. The coalescence process was recorded photographically from which the contact radius speed of the merging drops was measured. The liquid viscosity was determined by fitting the measured data with accurate numerical simulation of the coalescence process. Several liquids were tested and for each liquid several drop diameters were employed. Experimental and numerical results will be presented in which the viscosity of several highly viscous liquids were determined using this technique.